UNITED
NATIONS

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Security Council

Distr.
GENERAL

S/23122
8 October 1991

ORIGINAL: ENGLISH

NOTE BY THE SECRETARY-GENERAL

The Secretary-General has the honour to transmit to the members of the Security Council the attached communication which he has received from the Director-General of the International Atomic Energy Agency (IAEA).

best copy
available

Annex

Letter dated 3 October 1991 from the Director-General of the International Atomic Energy Agency addressed to the Secretary-General

Please find attached the first report of the sixth IAEA inspection in Iraq under Security Council resolution 687 (1991). You may deem it appropriate to transmit the report to the members of the Security Council. I remain, of course, available with the Chief Inspector, Mr. David Kay, for any consultations you or the Council may wish to have.

(Signed) Hans BLIX

Enclosure

First report on the sixth IAEA on-site inspection in Iraq under Security Council resolution 687 (1991)

22-30 September 1991

Introduction

1. The following report is based on a field analysis of documents obtained, photographed or seen during inspections of Iraqi establishments visited by the sixth IAEA inspection team. Most of the important documents were obtained, photographed or seen during visits to two establishments, the Nuclear Design Center and Petrochemical Three (PC-3) Headquarters, on 23 and 24 September 1991 respectively. The Appendix provides a chronology of activities.

2. The documents obtained or photographed by the team are for the greater part in Arabic, and there has been limited time for scanning. Only a few documents - although some very important ones - have so far been completely translated. Accordingly, a follow-up report will be issued after a thorough analysis of all the documentary material removed from Iraq.

Summary

3. The sixth IAEA inspection team obtained conclusive evidence that the Government of Iraq had a program for developing an implosion-type nuclear weapon, and it found documents linking this program - code-named "Petrochemical Three" (PC-3) - to Iraq's Ministry of Industry and Military Industrialization, the Iraqi Atomic Energy Commission (IAEC) and Iraq's Ministry of Defense. Documents were found showing that the nuclear weapons program was supported by broad-based international procurement efforts. Contrary to Iraq's claims of having only a peaceful nuclear program, the team found documents showing that Iraq had been working on the revision of a nuclear weapons design and one linking the IAEC to work on a surface-to-surface missile project - presumably the intended delivery system for their nuclear weapon.

PC-3 reports on Al Atheer

4. On the basis largely of top-secret progress reports found on 23 September 1991, the team concludes that Iraq was engaged in a broad-based effort to design and develop an implosion-type nuclear weapon. The documents, which cover a period up to 31 May 1990, describe nuclear weapons development experiments involving - for example - neutron

neutron initiators, enriched-uranium cores, reflectors, high-explosive lenses and electronic firing sets. One document points to Iraqi success in the machining of nuclear weapons components from natural uranium, but it is not clear from the document whether Iraq had enough highly enriched uranium for an actual explosive device.

5. One document links the Al Qa Qaa High Explosives and Propellant Facility to the program. Even more importantly, it shows clearly that nuclear weapons design work was conducted at Al Atheer - a facility which Iraq claims to have had no nuclear connection. A top-secret report states that the objective of the Al Atheer facility was to design and produce a nuclear device. Previous teams carrying out inspections under Security Council resolution 687 concluded that the Al Atheer facility was most probably to be used for nuclear weapons component production, high-explosive experiments and device assembly.

6. The inspection team also found evidence of Iraqi work on sophisticated computer codes used in the development of nuclear weapons, including one- and two-dimensional hydrodynamic and neutronic models which simulate the behaviour of nuclear weapons as they are being fired. Some of these sophisticated codes had been modified by Iraq before being used at Al Atheer. The document states that, as of June 1990, the basic design for Iraq's nuclear explosives device had gone through five modifications.

Additional evidence of intention to develop nuclear weapons

7. The reports on Al Atheer appear to be the most important of those found in four boxes full of classified Iraqi papers.[1/] The team also found a document suggesting the parallel development of a missile delivery system for the ongoing nuclear weapons program. In the document, the Ministry of Defense instructed the IAEC to postpone an experiment until after surface-to-surface missile testing.

8. Other documents contain evidence that since 1981 Iraq intended to produce enriched uranium by methods other than electromagnetic isotope separation. Specifically, the documents showed that Iraq explored gaseous diffusion and centrifuge enrichment techniques as late as 1988 and as early as 1982, respectively. The documents included an IAEC-accredited study in the field of nuclear implosion physics –another clear indication of nuclear weapons development intentions.

1/ It should be recalled, however, that the Government of Iraq seized these boxes from the inspection team on 23 September and has still not returned all of the documents which were in them. Notes by the team on some of these documents indicate that they contained additional information on the Iraqi nuclear weapons program.

Procurement activities

9. On the basis of documents seen during the inspection, the team believes that Iraq conducted substantial nuclear-weapons-related procurement from foreign sources. Catalogues from numerous suppliers were found at the PC-3 Headquarters, many of them translated into Arabic. However, because of the team's hasty exit from this establishment before being detained in a parking lot, much information was lost. Although - as just indicated - the team believes that the procurement in question was in support of the nuclear weapons program, it must be stressed that most items will probably prove to have been innocuous, multi-use items for which export licences were not needed and/or which were dispatched before imposition of the United Nations trade embargo.

10. From the documents seen it is evident that Iraq drew up lists of approved suppliers whose products would meet the program's technical specifications. On-site inspections of procured equipment and material have already shown that items supplied to the IAEC came from many countries.

11. The team found evidence that, realizing that large-scale purchasing abroad could attract outside attention, the Iraqi authorities devised cover explanations for purchases. In this connection, a country-wide survey of the types and amounts of the equipment required for the civilian sector was recommended, the idea being that indigenously produced items should be used in the civilian sector, while high-quality imported items bearing the same general descriptions would be used for the clandestine nuclear weapons program.

12. The team noted that the procurement of machinery had often been coupled with relevant on-the-spot training of Iraqi engineers by the manufacturer. In the case of machinery such as lathes and milling machines, test pieces had sometimes been ordered for the validation of technical specifications and computer numerical control software had sometimes been obtained.

13. At the PC-3 Headquarters, the team found many volumes of documents related to procurement for the Iraqi nuclear weapons program. A number of cover names used by Iraq in its procurement activities have been identified, and it is expected that this number will grow as further procurement records are translated.

Administration of the nuclear weapons program

14. From the documentation seen by it, the team concluded that the Iraqi nuclear weapons program was under the general control of the Ministry of Industry and Military Industrialization, with specific control assigned to PC-3. The team found numerous classified

communications with the IAEC heading and a sub-heading identifying PC-3, which confirms that some part of the IAEC was involved in the nuclear weapons program. In this connection it should be noted that the IAEC collaborated with the Iraqi Ministry of Defense on defense-related projects. The team has compiled a list of project activities to be followed up in the future.

15. The PC-3 employee lists show that Dr. Jaffar Dhia Jaffar was a senior administrator for the program. Similar documentation shows that Dr. Jaffar was intimately linked to the uranium enrichment program. The team accordingly believes that Dr. Jaffar had the lead technical and administrative responsibility for the nuclear weapons program as a whole - despite his repeated claims that no such program existed.

Iraq's obstructing of inspectors

16. Despite the success of the team in obtaining sensitive, classified documentation on Iraq's nuclear weapons program, one may never discover the true extent of that program. This is due partly to the fact that the Iraqi authorities confiscated documents collected on the first inspection day, despite strong protests by the team's Chief Inspector and the representative of the United Nations Special Commission (UNSCOM). Furthermore, it was obvious after reviewing the material returned to the team that some documents were missing. The team believes that, during the period of nearly seven hours before the return of the documents, the Iraqi authorities reviewed them, withholding the most sensitive ones. Although there might be other explanations, in the light of the continued attempts to conceal the true extent of Iraq's nuclear weapons program and of some very recent correspondence relevant to the programme found at one site, the question remains open whether Iraq has given up its nuclear weapons aspirations.

Continuing Iraqi non-compliance with Security Council resolutions

17. On the basis of the above, it is concluded that the documents found by the team clearly demonstrate that the Government of Iraq is in violation of Security Council resolutions 687 and 707. This is underscored by the fact that Iraq detained the inspectors and confiscated documents which had been legitimately collected.

18. Specifically, the following maybe noted:

- Iraq had - despite its statements to the contrary - a complex, comprehensive nuclear weapons development program characterized by parallel approaches to fissile material production and by theoretical/experimental design work

- Iraq still has substantial facilities which were part of the clandestine program and which have not been declared.

- Iraq has removed significant documentary material and equipment from identified nuclear program sites - including some documentary material removed shortly before the arrival of the team.

19. Iraq has violated the privileges and immunities to which the inspectors were entitled:

- it detained the team for five hours on the first inspection day,

- it confiscated all documents collected by the team during the first inspection visit,

- it interrupted access to the second inspection site before the team had completed its work,

- it detained the team for 96 hours in the parking lot next to the second inspection site,

- it opened official mail addressed to the team's Chief Inspector and to the UNSCOM representative.

20. From the evidence which the team has obtained and from the treatment of the team it is concluded that there was repeated and wilful non-compliance with Security Council resolutions 687 and 707 and violation of the UN/IAEA-specified privileges and immunities agreed to by the Government of Iraq.

Appendix

Chronology of Team Activities

The following is a general chronology of the activities of the 6th IAEA nuclear inspection team:

Date	Time	Activity
91/09/22	1000	Arrive Baghdad from Bahrain
91/09/23	0559	Arrive at first inspection site - the Nuclear Design Center
91/09/23	1006	Four boxes of classified IAEC documents found in basement of Nuclear Design Center
91/09/23	1545	Team attempts to depart first site
91/09/23	1600	First deadline for letting team depart site expires
91/09/23	1630	Iraqi authorities begin to review documents removed by team
91/09/23	1825	Dr. Jaffar arrives and demands a list of all documents
91/09/23	1830	Second deadline given by Chief Inspector to grant release of team expires
91/09/23	1900	Iraqi authorities confiscate documents collected by the team as the inspectors prepare to leave the facility
91/09/24	0200	Iraqi authorities return most, but not all - of the documents collected at the Nuclear Design Center
91/09/24	0620	Arrive at second inspection site, the Headquarters of the Petrochemical Three program
91/09/24	1050	Iraqi authorities demand that all work stop and that the team leave immediately
91/09/24	1230	Dr. Jaffar arrives and demands all documents and film. Stalemate ensues
91/09/27	1530	During continued detainment of the team, a fire is noted on the top floor of one of the two target buildings
91/09/28	0546	Team is released from parking lot and returns to hotel
91/09/28	0800-1900	IAEA-Iraqi inventory and review of documents collected from second inspection site

91/09/29	0730	Depart for final day of inspections
91/09/29	0800-0830	Search of warehouse for documents
91/09/29	0930-1300	Search of the IAEC Training Center
91/09/29	1330-1830	Search of the Reactor Siting and Planning Building
91/09/29	1630-1700	Search of grounds of Meeting House
91/09/30	1230	Depart Iraq for Bahrain

Annex to the First Report on the On-site Inspection
in Iraq under Security Council resolution 687 (1991)
22 - 30 September 1991

IMPORTANT NOTICE

This Annex is a translation from Arabic of an Iraqi report found by the 6th Agency inspection team on Monday, 23 September 1991 during an inspection in an Iraqi Atomic Energy Commission building in dowtown Baghdad. Its title is

"Al-Athir [Al-Atheer] Plant Progress Report
for the period 1 January 1990 to 31 May 1990"

((BEGIN TEXT))

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((COVER PAGE))

TOP SECRET - 5 ((SIC)) REPRODUCTION FORBIDDEN

MINISTRY OF INDUSTRY AND INDUSTRIALIZATION
PETROCHEMICAL PROJECT
3

((END COVER PAGE))

((PAGE 2))
MINISTRY OF INDUSTRY AND INDUSTRIALIZATION
PETROCHEMICAL PROJECT -3-

TITLE: AL-ATHIR PLANT PROGRESS REPORT FOR THE PERIOD FROM 1 JANUARY 1990 TO 31 MAY 1990

PREPARED BY: HEADQUARTERS, AL-ATHIR PLANT OFFICE

((MOSLEM DATE EQUIVALENT WRITTEN IN LONGHAND))

((END PAGE 2))

((PAGE 3))

THE REPUBLIC OF IRAQ

MINISTRY OF INDUSTRY AND MILITARY INDUSTRIALIZATION
AL-ATHIR PLANT

NUMBER: 1723/697
DATE: 17/11/1410 ((MOSLEM CALENDAR))
DATE: 11 NOVEMBER 1990

TOP SECRET

TO: DOCTOR NU'MAN SA'D-AL DIN AL-NU 'AIMI
SUBJECT: PROGRESS REPORT

REFERENCE YOUR LETTER NUMBER M/N 14 DATED 27 MAY 1990.

WE ENCLOSE HEREWITH A PROGRESS REPORT FOR THE AL-ATHIR PLANT FOR 1 JANUARY 1990 TO 31 MAY 1990.

PLEASE NOTE AND TAKE NECESSARY MEASURES. REGARDS.

HIKMAT NU'AIM AL-HILU ((OR JILU?))
ASSISTANT DIRECTOR GENERAL
9 JUNE 1990

COPY TO: DIRECTOR GENERAL. PLEASE NOTE. REGARDS.

((END PAGE 3))

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((PAGE 4))

ACCOMPLISHMENTS OF THE AL-ATHIR PLANT
FOR THE PERIOD
1 JANUARY 1990 TO 31 MAY 1990

((END PAGE 4))

((PAGE 5))

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AL-ATHIR PLANT PROGRESS REPORT FOR THE PERIOD
1 JANUARY 1990 TO 31 MAY 1990

THE GOAL OF THE AL-ATHIR PLANT PROGRAM IS THE DESIGN AND MANUFACTURE OF THE MECHANISM WHICH IS COMPOSED OF THE FOLLOWING PRINCIPAL PARTS:

NUCLEAR INITIATOR (POLONIUM-210 METAL/BERYLLIUM)
CORE (ENRICHED URANIUM METAL)
REFLECTOR (NATURAL URANIUM METAL)
TAMPER (HARDENED IRON)
EXPLOSIVE LENSES (PREPARED BY THE AL-QA' QA' GENERAL ESTABLISHMENT)
ELECTRONIC SYSTEMS (TRIGGERING, CONTROL AND GUIDANCE)

DURING THIS PERIOD A NUMBER OF ACCOMPLISHMENTS WERE ACHIEVED ON BOTH THE THEORETICAL AND PRACTICAL LEVEL. IN LIGHT OF THESE RESULTS, PREPARATIONS ARE UNDERWAY TO UPDATE THE BASIC DESIGN OF THE MECHANISM (FIFTH UPDATE) WHICH INCLUDES VARIOUS OPTIONS AND THE PREFERRED OPTION. THESE RESULTS CAN BE SUMMARIZED AS FOLLOWS:

THEORETICAL CALCULATIONS:

THE THEORETICAL CALCULATIONS ARE AIMED AT COMING UP WITH DESIGNS FOR THE IMPLOSION MECHANISM. IN ORDER TO ACCOMPLISH THIS MISSION THERE MUST BE A CLEAR AND PRECISE UNDERSTANDING OF MULTIPLE ASPECTS OF PHYSICS. THERE ALSO MUST BE A SET OF INTEGRATED CALCULATIONS FOR CONVERTING THE THEORETICAL CONCEPT INTO A PRACTICAL REALITY THROUGH COMPUTATIONS AND DESIGNS WHICH CAN BE APPLIED. THESE INCLUDE THE FOLLOWING:

1. IN THE AREA OF GENERATING THEORETICAL EQUATIONS OF STATE, A GENERAL EQUATION OF STATE WAS DERIVED WHICH USED THE "BARNES" (?) MODEL FOR PRESSURE COMBINED WITH THE THOMAS-FERMI-DIRAC MODEL UNDER HIGH PRESSURE. THIS

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EQUATION OF STATE WAS COMPARED WITH ANOTHER ANALYTICAL EQUATION AND THE RESULTS SHOWED THAT THE "BARNES" EQUATION OF STATE IS CLOSER TO PRACTICAL RESULTS FOR URANIUM. THERE IS ALSO A CORRELATION BETWEEN THE TWO EQUATIONS IN A HIGH PRESSURE REGIME.

2. IN THE AREA OF THEORETICAL MODELS, A PLIANT-FLEXIBLE BEHAVIOR AND MODEL FOR STRESSES WERE INSERTED INTO THE COMPUTATION, WHICH SOLVED THE ONE-DIMENSIONAL HYDRODYNAMIC EQUATIONS.

3. IN THE AREA OF TWO-DIMENSIONAL HYDRODYNAMIC PROGRAMS, PROGRAMS WERE DEVELOPED WHICH SOLVED THE TWO-DIMENSIONAL HYDRODYNAMIC EQUATIONS IN ORDER TO TAKE INTO CONSIDERATION THE DEVELOPMENT OF DISTORTIONS OVER A PERIOD OF TIME. THIS NEW POSSIBILITY OF THE PROGRAM WAS TESTED IN EXPERIMENTS USING FLYING METAL PLATES TO STUDY THE EFFECT OF ELASTICITY AND FLEXIBILITY ON THE WAY IN WHICH DISTORTIONS GROW, AS WELL AS THE EFFECT OF OTHER RELEVANT FACTORS PREPARATORY TO USING THE SAME CONCEPTS IN A STUDY OF SPHERICAL SYSTEMS AND DESIGN OPTIONS. THESE PROGRAMS WERE USED IN AN INITIAL STUDY OF THE STABILITY OF SOME DESIGN OPTIONS PREPARATORY TO STUDY OF THIS SUBJECT IN A MORE DETAILED MANNER. IN THE SAME AREA, A LOCAL PROGRAM WAS COMPLETED WHICH SOLVED THE TWO-DIMENSIONAL HYDRODYNAMIC EQUATIONS AND SOME INITIAL TESTS WERE CONDUCTED ON IT. TESTS ARE NOW BEING CONDUCTED UNDER CONDITIONS IN WHICH THE ((PROGRAM'S)) EFFECTIVENESS IS MORE DIFFICULT TO CONFIRM.

4. IN THE AREA OF COMBINED HYDRODYNAMIC-NEUTRONIC PROGRAMS AND CALCULATIONS, A PROGRAM WAS DEVELOPED SO THAT IT WOULD BE POSSIBLE TO CALCULATE A NUMBER OF NEUTRONIC GENERATIONS WHICH ARE PRODUCED WHEN LARGE AMOUNTS OF ENERGY ARE LIBERATED FROM THE SYSTEMS WHOSE TOTAL ENERGY HAD PREVIOUSLY BEEN CALCULATED BY USING THE SAME PROGRAMS. TWO COMPUTATIONS WERE ALSO COMPLETED WHICH CARRIED OUT THE COMBINED HYDRODYNAMIC-NEUTRONIC CALCULATIONS. BOTH PROGRAMS USE A HYDRODYNAMIC PROGRAM WHICH HAD BEEN WRITTEN LOCALLY AND WHICH RELIED ON A WELL-KNOWN METHOD IN SOLVING HYDRODYNAMIC EQUATIONS. BY USING THESE INTER-RELATED PROGRAMME,

VARIOUS CALCULATIONS WERE CARRIED OUT FOR SEVERAL PROPOSED SYSTEMS.

5. IN THE AREA OF THE FLYING PLATES AND THEIR USE IN INCREASING THE PRESSURE WAVE, A STUDY OF THE EVEN SHOCK WAVE WAS CONDUCTED ON THESE PLATES BOTH WITH A LAYER OF EXPLOSIVES AND WITHOUT THIS LAYER. THE RESULT SHOWED GOOD AGREEMENT WITH SOME OF THE PRACTICAL RESULTS WHICH HAD BEEN PUBLISHED FOR AMUMINIUM AND ESPECIALLY IN REGARD TO THE FREE SURFACE VELOCITY AND OBTAINING FISSURES IN THESE FLYING PLATES. THIS WAS PREPARATORY TO CONDUCTING SIMILAR STUDIES ON HOW TO USE THE SPHERICAL FLYING PLATES TO ENLARGE THE PRESSURE WAVE.

6. IN THE AREA OF USING THE LINEAR THEORY OF DISTURBANCE TO STUDY AND CALCULATE THE GROWTH OF DISTORTIONS IN PARTS OF THE MECHANISM OVER A PERIOD OF TIME AS WELL AS THE STABILITY OF THE SPHERICAL SHOCK WAVE, AN INITIAL PROGRAM WAS CONSTRUCTED WHICH SOLVED THE ONE-DIMENSIONAL HYDRODYNAMIC EQUATIONS; THIS PROGRAM WAS COMBINED WITH ANOTHER PROGRAM WHICH USED THE LINEAR DISTURBANCE THEORY EQUATIONS. SOME TESTS WERE PERFORMED ON THIS PROGRAM TO CONFIRM ITS VALIDITY. THESE TESTS INDICATED THE PRESENCE OF SOME DIFFICULTIES AT THE BEGINNING, BUT THESE WERE OVERCOME FOLLOWING CONCENTRATED EFFORTS. WORK IS NOW UNDERWAY TO DEVELOP THIS PROGRAM.

7. IN THE AREA OF MOLECULAR DYNAMICS, A ONE-DIMENSIONAL COMPUTATION WAS DEVELOPED AS AN INITAIL PHASE AND IT IS CURRENTLY BEING APPLIED TO CARRY OUT SOME PRESSURE AND TEMPERATURE CALCULATIONS TO CONFIRM ITS VALIDITY.

8. IN THE AREA OF RESEARCHING THE LITERATURE, A NUMBER ((OF ARTICLES)) OF SPECIFIC IMPORTANCE WERE IDENTIFIED, THEORETICAL UNDERSTANDING OF THE SUBJECT WAS INCREASED THROUGH EXHAUSTIVE STUDY AND A NUMBER OF THE SCIENTIFIC COMPUTATIONS WERE AFFECTED WHICH MOVED THE WORK AHEAD, SUCH AS THE HYDRODYNAMIC PROGRAM, WHICH SOLVED THE ONE-DIMENSIONAL HYDRODYNAMIC EQUATIONS WITH RADIATION TRANSPORT AS WELL AS THE NEUTRONIC PROGRAM

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WHICH SOLVED THE NEUTRON TRANSPORT EQUATION THROUGH THE MONTE CARLO METHOD. THESE PROGRAMS WERE COMPLETED AND THEY WERE INSERTED INTO THE COMPUTER. CONCENTRATED ATTEMPTS ARE NOW UNDERWAY TO RUN THEM IN PREPARATION TO TESTING THEM AND DEVELOPING THEM IN THE DIRECTION WHICH WOULD HELP MOVE THE THEORETICAL WORK FORWARD AND FACILITATE THE ANSWERING OF A NUMBER OF QUESTIONS.

9. THE THEORETICAL UNDERSTANDING WAS UTILIZED AND THE COMPUTATION WAS USED WHICH HAD BEEN PREVIOUSLY CONSTRUCTED TO UPDATE THE BASIC REPORT. THIS INCLUDED HYDRODYNAMIC AND COMBINED HYDRODYNAMIC-NEUTRONIC CALCULATIONS WHICH USE THE LATEST THEORETICAL INFORMATION AVAILABLE REGARDING EQUATION OF STATE.

PRODUCTION OF MATERIAL:

1. PRODUCTION OF POLONIUM-210

POLONIUM-210 IS CONSIDERED ONE OF THE BASIC COMPONENTS FOR MANUFACTURING THE NUCLEAR INITIATOR. IN ORDER TO PRODUCE IT, A NUMBER OF RESEARCH EXPERIMENTS WERE CONDUCTED AND DEVELOPED IN ORDER TO ESTABLISH A PLAN FOR THE CHEMICAL PROCESSES TO PRODUCE IT THROUGH IRRADIATING BISMUTH IN THE NUCLEAR REACTOR AND THEN EXTRACTING AND PURIFYING THE POLONIUM AND PRECIPITATE IT ELECTRICALLY IN ORDER TO PREPARE THE POLONIUM-210 SOURCES. THROUGHOUT THIS PERIOD A CAMPAIGN WAS CONDUCTED WHICH INCLUDED THE IRRADIATION OF 14.85 KILOGRAMS OF BISMUTH AND OBTAINING SIX MILLIGRAMS OF POLONIUM. SOME OF IT WAS USED TO CONDUCT RESEARCH AND DEVELOPMENT EXPERIMENTS, AND SOME OF IT WAS USED TO PREPARE FIVE SOURCES OF POLONIUM-210 IN QUANTITIES OF BETWEEN 1.25 AND 0.065 MILLIGRAMS BY ELECTROPLATING IT ONTO GOLD IN A NITRIC AND HYDROFLUORIC ACID MEDIUM, IN ORDER TO CARRY OUT THE NUCLEAR INITIATOR TESTS AND MEASUREMENTS.

2. PRODUCTION OF PLUTONIUM

THE NEED FOR THE PRODUCTION OF PLUTONIUM CALLS FOR THE PREPARATION OF SOURCES OF ALPHA EMITTERS TO SUPPORT INITIATOR TESTS AND THE NECESSARY MEASUREMENTS. IN ORDER TO PRODUCE PLUTONIUM, THE FOLLOWING WAS CARRIED OUT:

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A. THE IMPLEMENTATION OF BASIC OPERATIONS PRECEDED THE START OF WORK CAMPAIGNS TO REPROCESS SPENT NUCLEAR FUEL INCLUDING THE PROCESS OF REMOVING HIGHLY RADIOACTIVE WASTE, HOT (WORD ILLEGIBLE) ENGINEERING TESTING OF THE RADIO-CHEMICAL LABORATORY UNIT SYSTEMS WHICH ARE USED TO TREAT THE SPENT NUCLEAR FUEL. IN ADDITION, THE RADIOACTIVE WASTE WHICH ACCUMULATED IN THE RADIO-CHEMICAL LABORATORIES AND WHICH WAS PROCESSED IN THE RADIOACTIVE WASTE PROCESSING STATION WAS REMOVED. THIS WORK IS A PROCEDURE WHICH IS BEING CARRIED OUT FOR THE FIRST TIME.

B. THE REPROCESSING OF IRAQI NUCLEAR FUEL ELEMENT (EK-07) MANUFACTURED LOCALLY AND IRRADIATED IN THE TAMMUZ 14 ((JULY 14)) REACTOR. THIS RESULTED IN THE SEPARATION OF 510 MILLIGRAMS OF PLUTONIUM, AND WORK IS NOW UNDERWAY TO IMPLEMENT A CAMPAIGN TO PROCESS ANOTHER IRAQI NUCLEAR FUEL ELEMENT IRRADIATED FOR 50 DAYS INSTEAD OF THE 22 DAYS OF IRRADIATION FOR THE FIRST ELEMENT. SO FAR, 750 MILLIGRAMS OF PLUTONIUM HAVE BEEN SEPARATED AS A RESULT OF THE PROCESSING OF 12 FUEL RODS FROM THIS ELEMENT.

THE PROCESSING OF THIS TYPE OF FUEL IS BEING DONE FOR THE FIRST TIME BECAUSE IT IS MANUFACTURED LOCALLY. MOREOVER, THE RAW MATERIAL WHICH GOES INTO ITS MANUFACTURE, URANIUM DIOXIDE, IS DERIVED FROM IRAQI RAW PHOSPHATE. A SPECIAL REPORT WAS SUBMITTED TO THE PROJECT HEADQUARTERS REGARDING THIS ACHIEVEMENT. THE RESULTING PLUTONIUM CONTAINS A LARGE PERCENTAGE OF THE 239 ISOTOPE.

C. IN ADDITION, 25 MICROGRAMS OF PLUTONIUM-238 WERE PREPARED THROUGH THE IRRADIATION OF 200 MILLIGRAMS OF NEPTUNIUM-237 IN THE TAMMUZ 14 REACTOR. THEN SEPARATION OPERATIONS WERE CONDUCTED USING ANION EXCHANGE RESINS AND THE RECOVERY OF NEPTUNIUM-237 FOR THE PURPOSE OF RE-IRRADIATION. ADDITIONAL QUANTITIES OF PLUTONIUM-238 WERE EXTRACTED FOR THE PURPOSE OF PREPARING OTHER SOURCES OF ALPHA EMITTERS NEEDED FOR NUCLEAR INITIATOR TESTS.

WORK IS CONTINUING ALSO TO CONVERT PLUTONIUM

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COMPOUNDS RESULTING FROM THE NUCLEAR FUEL REPROCESSING INTO METAL.

3. PRODUCTION OF NATURAL URANIUM METAL.

NATURAL URANIUM METAL IS USED TO MANUFACTURE PART OF THE REFLECTOR IN THE IMPLOSION MECHANISM. IN ORDER TO PRODUCE IT, A NUMBER OF RESEARCH AND DEVELOPMENT EXPERIMENTS WERE CONDUCTED TO ESTABLISH THE CHEMICAL PROCEDURES FOR PRODUCING URANIUM TETRAFLUORIDE AS AN INTERMEDIATE MATERIAL, AND THEN URANIUM METAL. DURING THIS PERIOD, THE EQUIVALENT OF 2.2 TONS OF URANIUM TETRAOXIDE WERE PURIFIED AND CONVERTED INTO URANIUM DIOXIDE, WHICH WAS USED TO PREPARE THE EQUIVALENT OF 407 KILOGRAMS OF URANIUM TETRAFLUORIDE BY USING LABORATORY PROCEDURES. THIS MATERIAL WAS USED TO PREPARE URANIUM METAL IN THE SHAPE OF CYLINDRICAL BLOCKS. THIS WAS THEN DEVELOPED TO PREPARE THE METAL BY MEANS OF DIRECT CASTING IN THE SHAPE OF DISCS SO THAT THE EQUIVALENT OF 254 KILOGRAMS OF URANIUM METAL WERE PREPARED BY USING LABORATORY PROCEDURES ALSO.

IN THE LIGHT OF THESE RESULTS, BASIC DESIGN REPORTS WERE DRAWN UP FOR SEMI-INDISTRIAL SYSTEMS FOR THE PRODUCTION OF URANIUM TETRAFLUORIDE AND URANIUM METAL. DETAILED DESIGNS WERE SUBMITTED AND SOME OF THE SYSTEMS WERE MANUFACTURED AND INSTALLED. ([WE ARE]) AWAITING COMPLETION OF THE MANUFACTURING PROCESS AND THE INSTALLATION OF OTHER SYSTEMS AT THE AL-AMIL (?) PLANT. IN ADDITION, ALL BASIC DESIGN REPORTS FOR SIMILAR SYSTEMS WERE PREPARED AFTER SOME IMPROVEMENTS WERE MADE ON THEM, ENTAILING THE COMPLETION OF THE DETAILED DESIGNS AND MANUFACTURE OF THE SYSTEMS FOR THE PURPOSE OF PREPARING THEM TO BE INSTALLED IN THE AL-ATHIR PLANT.

IN ADDITION TO THIS, SUPPORT SYSTEMS WERE PREPARED, INCLUDING THE PROCESSING OF CHEMICAL WASTE LEFT OVER FROM THE PRODUCTION OF THESE MATERIALS. MOREOVER, REQUIREMENTS FOR QUALITY CONTROL TO EVALUATE THE MATERIALS WHICH WERE PRODUCED WERE COMPLETED.

4. PRODUCTION OF ENRICHED URANIUM METAL.

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ENRICHED URANIUM IS USED IN THE MANUFACTURE OF PART OF THE CORE IN THE IMPLOSION MECHANISM. A NUMBER OF RESEARCH AND DEVELOPMENT EXPERIMENTS WERE CONDUCTED TO PURIFY AND RECOVER THE URANIUM. BASIC DESIGN REPORTS FOR THE MANUFACTURE OF URANIUM TETRAFLUORIDE AND ENRICHED URANIUM METAL WERE DRAWN UP IN LIGHT OF THE INITIAL EXPERIMENTS USING NATURAL URANIUM.

A NUMBER OF RESEARCH AND DEVELOPMENT EXPERIMENTS WERE CONDUCTED TO PURIFY URANIUM THROUGH CHEMICAL METHODS AND ESTABLISH A PLAN FOR PROCESSES, AND DETAILED DESIGNS WERE PREPARED. THE SYSTEMS WERE MANUFACTURED SOME OF WHICH ARE NOW BEING INSTALLED; OTHERS ARE AWAITING MANUFACTURE.

5. PRODUCTION OF YELLOW CERIUM SULPHIDE

YELLOW CERIUM SULPHIDE IS CONSIDERED A PREFERRED MATERIAL FOR MANUFACTURING CRUCIBLES FOR THE MELTING AND CASTING OF URANIUM METAL. DUE TO THE DIFFICULTY OF OBTAINING IT IN THE REQUIRED QUANTITIES, A RESEARCH AND DEVELOPMENT PROGRAM HAS BEEN ESTABLISHED TO PRODUCE THIS MATERIAL IN THE LABORATORY THROUGH THE PREPARATION OF INTERMEDIATE MATERIALS.

THROUGHOUT THIS PERIOD 10 KILOGRAMS OF YELLOW CERIUM SULPHIDE WERE PREPARED. IT WILL BE PURIFIED ONCE THE REQUIREMENTS NEEDED FOR MANUFACTURING THE PURIFICATION SYSTEM ARE MET. WORK IS CURRENTLY UNDERWAY TO MANUFACTURE THEM IN LIGHT OF THE DETAILED AND BASIC DESIGNS WHICH HAVE BEEN DRAWN UP.

MATERIALS PROGRAM

THE MATERIALS PROGRAM FORMS THE BACKBONE OF THE WORK OF THE AL-ATHIR PLANT. IT INCLUDES A STUDY OF THE SPECIFICATIONS OF THE MATERIAL BEFORE AND AFTER IT IS SUBJECTED TO PRESSURE AND HEAT EXTREMES. IT ALSO INCLUDES MEASUREMENT AND DESCRIPTION OF THIS MATERIAL. THROUGH THE IMPLEMENTATION OF THESE MISSIONS THE FOLLOWING

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ACCOMPLISHMENTS WERE ACHIEVED:

1. DETERMINATION OF THE TECHNOLOGICAL PARAMETERS, DETERMINATION OF THE EQUIPMENT REQUIREMENTS, AND IMPLEMENTATION OF CONTRACTS CONCLUDED WITH A NUMBER OF COMPANIES WITHIN THE MATERIALS PROGRAM.

2. IMPLEMENTATION OF A NUMBER OF ACTIVITIES IN THE FOLLOWING AREAS:

A. MELTING AND CASTING OF URANIUM METAL. THE RESULTS MADE IT POSSIBLE TO MELT AND CAST URANIUM METAL IN THE SHAPE OF RODS EACH WEIGHING 3 KILOGRAMS. THIS WAS DONE THROUGH THE DEVELOPMENT OF LABORATORY MELTING FURNACES CURRENTLY AVAILABLE. IN ADDITION, COATING RESOURCES WERE DEVELOPED WHICH ISOLATE THE METAL FROM THE CRUCIBLE MATERIAL WHICH IS BEING PRODUCED CURRENTLY. THIS IS DONE BY PROVIDING A PLASMA SPRAY SYSTEM WHICH IS CONSIDERED AN ADVANCED SYSTEM IN THIS FIELD.

B. POWDER TECHNOLOGY LINE. A NUMBER OF RESEARCH AND DEVELOPMENT EXPERIMENTS WERE CONDUCTED TO PREPARE THE NECESSARY CERAMIC MATERIAL FOR THE PRODUCTION OF CAPACITORS AND THE PRODUCTION OF RUBBER COVERS FOR USE IN THE FIELD OF "COLD BALANCED PRESSURE" (?) TECHNOLOGY.

C. A NUMBER OF TYPES OF PRESSURE SENSORS WERE PRODUCED FROM MANGANESE (?), PLASTICS AND QUARTZ FOR MEASURING PRESSURE AND VARIABLES.

D. A PROGRAM WAS DRAWN UP FOR THE IMPLEMENTATION OF A NUMBER OF EXPERIMENTS FOR THE STUDY OF CHARACTERISTICS OF MATERIALS WHEN THEY ARE SUBJECTED TO PRESSURE AND TEMPERATURE EXTREMES THROUGH THE USE OF EXPLOSIVE LENSES.

3. QUALITY CONTROL INSPECTION LABORATORIES WERE PREPARED BY PROVIDING SEVERAL PIECES OF EQUIPMENT AND ADVANCED SYSTEMS WHICH ARE USED TO CHARACTERIZE METALS AND CERAMIC MATERIALS FROM PHYSICAL, METALURGICAL AND MECHANICAL ASPECTS. A NUMBER OF PIECES OF EQUIPMENT WERE

FINISHED AND INSTALLED, THOSE WHICH WERE IMPORTED AND THOSE WHICH WERE TRANSPORTED FROM THE ORIGINAL SITE TO THE AL-ATHIR PLANT. PERSONNEL WERE ALSO TRAINED ON THE OPERATION OF THIS EQUIPMENT IN ORDER TO CONDUCT THE REQUIRED TESTS AND ANALYSES.

THE FOLLOWING IS A SUMMARY OF THE ITEMS OF EQUIPMENT AND SYSTEMS WHICH WERE RECEIVED, TRANSPORTED, INSTALLED, PUT INTO OPERATION DURING THIS PERIOD:

FIRST: SOME EQUIPMENT WAS INSTALLED IN TEMPORARY SITES, THEN DISMANTLED AND TRANSPORTED AND REINSTALLED IN THE WORK SITES; THESE INCLUDE:

- PLASMA SPRAY SYSTEM
- ELECTRONIC SCANNER AND ANALYTIC SENSORS
- PLASMA CHEMICAL ANALYSIS SYSTEM
  SINGLE X-RAY DIFFRACTION SYSTEM

SECOND: INSTALLATION OF SYSTEMS WHICH RECENTLY REACHED THE PLANT SITE DIRECTLY. THESE INCLUDE:

- MECHANICS/CHARACTERISTICS ((TESTING)) SYSTEMS
- NON-DESTRUCTIVE TEST SYSTEMS
- METALLOGRAPHY SYSTEMS
- ELECTRONIC ((SIC)) PIERCING SYSTEM
- MODEL PREPARATION EQUIPMENT

THIRD: TRANSPORTATION OF ITEMS OF EQUIPMENT AND SYSTEMS FROM THE AL-TUWAITHA SITE TO THE PLANT SITE AND THEN INSTALLED AND STARTED UP:

- MELTING AND CASTING FURNACE
- ((ONE WORD ILLEGIBLE)) FURNACE
- OPTICAL COMPARATOR
- POWDER X-RAY DIFFRACTION SYSTEM
- THERMAL ANALYSIS SYSTEMS
- SLIP CASTING SYSTEMS

FOURTH: RECEIPT OF A SET OF EQUIPMENT WHICH IS IN THE

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PROCESS OF BEING INSTALLED, AND PREPARATION OF TEMPORARY INSTALLATION SITES FOR OTHER SYSTEMS. THESE INCLUDE:

- LARGE COLD ISOSTATIC PRESS
- SMALL COLD ISOSTATIC PRESS
- SMALL HOT ISOSTATIC PRESS
- PULVERISING AND SIFTING SYSTEMS
- VAPOR COATING SYSTEMS
- DIMENSIONAL MEASURING DEVICE
- SET OF SMALL FURNACES
- SURFACE ANALYSIS SYSTEMS

TESTS:

1. DETONATION TESTS

BASIC REPORTS FOR DETONATION TESTS WERE DRAWN UP. THESE ARE BEING CONDUCTED AT SITE 100. THE REQUIREMENT NEEDS FOR THESE TESTS ARE BEING PREPARED AND 20 DETONATION TESTS HAVE BEEN CARRIED OUT BY USING EXPLOSIVE LENSES WHICH HAVE BEEN PREPARED AT AL-QA'QA' GENERAL FACILITY. THESE TESTS ARE AIMED AT MEASUREMENT OF THE HOMOGENEITY OF THE WAVE FRONT. SOME ENCOURAGING RESULTS WERE ACHIEVED IN THIS AREA. ALSO, EXPERIMENTS WERE CONDUCTED TO TEST THE INTERNAL INITIATOR MODELS USING EXPLOSIVE LENSES. IN ADDITION TO THAT, AN ELECTRONIC SYSTEM WAS DESIGNED, MANUFACTURED AND CALIBRATED WHICH IS USED TO MEASURE VERY SMALL TIME INTERVALS DURING THESE EXPERIMENTS.

2. NEUTRONIC TESTS

A LIQUID SCINTILLATION SYSTEM WAS INSTALLED AND CALIBRATED FOR MEASURING WEAK NEUTRONIC YIELD, AND MEASUREMENTS OF THE DEGREE OF URANIUM ENRICHMENT WERE MADE.

A SYSTEM WAS INSTALLED AND PUT INTO OPERATION FOR MEASURING NEUTRONS RESULTING FROM THE OXIDATION ((SIC)) OF POLONIUM-210. ALSO THE REQUIREMENTS FOR THE DENSE PLASMA FOCUSING LABORATORY WERE PREPARED. WORK IS CONTINUING WITHIN THE FRAME WORK OF RESEARCH AND DEVELOPMENT WITH

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THE GOAL OF USING IT IN THE FUTURE EXTERNAL INITIATOR.

3. NUCLEAR INITIATOR:

THE NUCLEAR INITIATOR FOR THE MECHANISM CONSISTS OF TWO PRINCIPAL MATERIALS, POLONIUM-210 AND BERYLLIUM, SEPARATED BY A THIN GOLD COATING. WHEN THIS COATING IS RUPTURED AS A RESULT OF THE FIRST EXPLOSION OF THE LENSES AND THE SHOCK WAVE, THE NEUTRONS ARE LIBERATED THROUGH THE INTERACTION OF THE ALPHA PARTICLES EMITTED FROM THE POLONIUM-210 WITH THE NUCLEUS OF THE BERYLLIUM ((ATOMS)). THESE NEUTRONS ARE WHAT CAUSE THE INITIATION OF THE FISSION CHAIN REACTION OF THE NUCLEI OF THE URANIUM-233. AFTER THE DESIGN CALCULATIONS WERE COMPLETED FOR DETERMINING THE NEUTRONS EMITTED FROM THE INITIATOR, SEVERAL DESIGNS FOR THIS INITIATOR WERE DRAWN UP FOR TESTING TO CHOOSE THE IDEAL ONE. IN CONNECTION WITH THESE TESTS, THE A SYSTEM FOR CALIBRATING THE INITIATOR MODEL WITHOUT NUCLEAR COMPONENTS WAS MANUFACTURED AND INSTALLED. TESTS WERE CONDUCTED WITH THE NUCLEAR COMPONENTS AND NEUTRONS WERE OBTAINED. ALSO, THE INITIAL TESTING SYSTEM WAS MANUFACTURED AND INSTALLED FOR MEASURING THE VELOCITY RANGING BETWEEN 600 AND 1000 METERS PER SECOND. IN ORDER TO OBTAIN THE MAXUMIM VELOCITY, A BASIC REPORT WAS DRAWN UP FOR THE INITIATOR MODEL TESTS ON THE HAMMER SYSTEM FOR WHICH THE CORNERSTONE WAS RECENTLY INSTALLED.

THE FINAL TESTS FOR THE INITIATOR WILL BE CONDUCTED WHEN THE LENSES AND MATERIAL FOR A MOCK CORE OF THE MECHANISM ARE MADE.

4. PRIMARY FLASH X-RAY SYSTEM (160 KV)

APPARENT CALCULATIONS FOR FIELD EMISSION WERE MADE AND ALSO DESIGNS WERE DRAWN UP FOR THE CATHODE USED IN THE SYSTEM. ALSO THE BASIC REPORT WAS PREPARED FOR THE SUPPLEMENTARY SYSTEM WHICH WAS MANUFACTURED, INSTALLED, PUT INTO OPERATION AND SUCCESSFULLY TESTED. WORK IS CONTINUING TO COMPLETE THE DESIGN AND MANUFACTURE OF THE 600 KV SUPPLEMENTARY SYSTEM WHICH CANNOT BE OBTAINED COMMERCIALLY.

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FIRING, CONTROL AND GUIDANCE SYSTEMS:

1. SYNCHRONIZATION AND TIMING SYSTEMS

AT THE BEGINNING OF 1989 A BASIS DESIGN REPORT FOR THE SYNCHRONIZATION AND TIMING SYSTEM WAS DRAWN UP FOR PROVIDING ENERGY FOR THE DETONATOR CABLES WITHIN SPECIFIC DESIGN OPTIONS. THE DESIGNS WER MADE. THE BRANCHING CABLE DETONATOR SYSTEMS (2, 4, 8, 16, AND 32) WERE IMPLEMENTED AND BUILT IN JULY OF THE SAME YEAR. AT THE BEGINNING OF 1990 AN ADVANCED MINIATURIZED SYSTEM (REDUCED TEN TIMES IN WEIGHT AND SIZE) WAS DEVELOPED FOR 32 CABLES WEIGHING UP TO 5 KILOGRAMS. IT PROVIDES THE ENERGY WITHIN TIME VARIATIONS NOT EXCEEDING 10 NANOSECONDS. AN INTEGRATED SYSTEM FOR FOUR DETONATION CABLES WAS DELIVERED TO THE AL-QA'QA' FACILITY AND ANOTHER IS BEING USED SUCCESSFULLY IN TESTS WHICH ARE BEING CONDUCTED IN THE PLANT. THE ABOVE WORK AMOUNTED TO A SCHOOL FROM WHICH DESIGN CONCEPTS WERE DERIVED FOR TESTING HIGH-SPEED MEASURING DEVICES AND SENSORS, IN ADDITION TO DESIGNS FOR PULSE-POWER DEVICES FOR THE DENSE PLASMA FOCUS SYSTEM AND THE MARX GENERATOR FOR GENERATING SUPER-HIGH VOLTAGE PULSES IN THE FLASH X-RAY SYSTEM. THE ABOVE SYSTEMS ARE WORKING SUCCESSFULLY NOW. NOTE THAT IT IS NOT POSSIBLE TO OBTAIN ANY OF THE ABOVE SYSTEMS COMMERCIALLY.

2. PULSE-POWER EQUIPMENT

PULSE-POWER EQUIPMENT WAS DESIGNED AND BUILT FOR DENSE PLASMA FOCUS SYSTEMS, WITH SPECIFICATIONS OF 10 KILOVOLTS, 300 KILOAMPERES, AT A TIME OF 1.8 MICROSECONDS, AND A MARX GENERATOR FOR GENERATING SUPER-HIGH VOLTAGE PULSES IN THE FLASH X-RAY SYSTEM, WITH SPECIFICATIONS OF 160 KILOVOLTS AND A CURRENT OF 1600 AMPERES. THESE SYSTEMS ARE NOW OPERATING SUCCESSFULLY AND THEY ARE BEING DEVELOPED TO BETTER SUIT REQUIREMENTS. NOTE THAT IT IS NOT POSSIBLE TO OBTAIN ANY OF THEM COMMERCIALLY.

3. CHARGING POWER EQUIPMENT.

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CHARGING POWER EQUIPMENT WAS DESIGNED AND BUILT TO BE USED IN THE SYSTEM FOR SUPPLYING POWER TO THE DETONATION CABLES. THIS RESULTED IN THE DEVELOPMENT AND DESIGN OF MINIATURIZED POWER EQUIPMENT SYSTEM (1000 TIMES) WEIGHING 500 GRAMS AND MEETING REQUIREMENTS FOR USE. NOTE THAT IT IS NOT POSSIBLE TO OBTAIN THESE SYSTEMS COMMERCIALLY.

4. JUNCTION SWITCHES

IN VIEW OF THE HIGHLY SPECIALIZED APPLICATION OF THE HIGH ENERGY PULSE JUNCTION SWITCHES A NUMBER OF JUNCTION SWITCHES WITH A SPARK GAP APPROACHING 200 KILOAMPERES AND VOLTAGE OF 50 KILOVOLTS. THE DEVELOPMENT AND MANUFACTURE OF THIS TYPE OF SWITCH MAKES UP FOR THE USE OF OTHER SWITCHES SUCH AS THE KRYTRON, WHICH CANNOT BE OBTAINED COMMERCIALLY.

5. CAPACITORS

CAPACITORS WERE DESIGNED AND BUILT THROUGH THE USE OF TWO TECHNOLOGIES, HIGH-VOLTAGE CHIP SENSORS FOR THE SYNCHRONIZATION AND TIMING SYSTEM, AND THE CERAMIC CAPACITORS WHICH ARE USED IN THE FLASH X-RAY SYSTEMS. CERAMIC CAPACITORS WERE MANUFACTURED. THE SLOW IMPORTED CAPACITORS WERE CONVERTED AND TURNED INTO HIGH-SPEED ((CAPACITORS)) AND INDUCTANCE WAS REDUCED FROM 250 TO 13 NANOHENRYS.

ALSO, 5-NANOHENRY 45-KILOVOLT DISC CAPACITORS WERE MANUFACTURED AND THEY WILL BE USED IN THE MARX GENERATOR TO REACH 600 KILOVOLTS.

6. MEASUREMENTS

THE FOLLOWING WERE DESIGNED AND CARRIED OUT:

(1) SYSTEMS FOR MEASURING CURRENT AND PULSE VOLTAGE OF SYSTEMS.

(2) SYSTEMS FOR MEASURING MINUTE SEGMENTS OF TIME FOR

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DETONATION TESTS IN INTERVALS OF BETWEEN NANO- AND MICROSECONDS WITH A HIGH DEGREE OF ACCURACY REACHING SEVERAL PICOSECONDS.

SUPPORT ACTIVITIES:

1. SYSTEMS FOR DERIVING DATA.

A NUMBER IF THESE SYSTEMS WERE CREATED TO SUPPORT TESTS IN VARIOUS PARTS OF THE PLANT. THEY COVERED PROGRAMS TO ANALYZE DATA DERIVED FROM THEORIES FOR NEUTRON INITIATOR TESTS AND THE LOW-NEUTRON BACKGROUND MEASUREMENTS USING AN ANALOG DATA BUS.

2. COMMUNICATIONS SYSTEMS WERE CREATED FOR THE PROJECT SITES TAKING INTO CONSIDERATION THE SPECIAL CHARACTERISTICS OF THE SITES AND GUARANTEEING COMMUNICATIONS SECURITY. THESE NETS WERE DEVELOPED THROUGH LOCAL EXPERTISE AND WITH PROJECT PERSONNEL. THEY INCLUDE SWITCHBOARDS, ((FIBER-))OPTIC AND TELEPHONE CABLES AND DIGITAL COMMUNICATIONS. NOTE THAT SOME OF THE EXPERTISE WHICH IN EMPLOYED IN THE PROJECT IS NOT AVAILABLE IN THE COUNTRY.

3. MECHANICAL DESIGNS:

DESIGNS FOR MECHANICAL SYSTEMS WERE CREATED WHICH ARE REQUIRED BY THE VARIOUS DIVISIONS OF THE PLANT TO SUPPORT THE TESTS AND PRODUCTION OPERATIONS. SOME OF THESE DESIGNS REQUIRE PRECISE OPERATING TECHNOLOGY. THEY INCLUDE:

DESIGNS FOR MODELS OF NEUTRON INITIATORS AND DESIGNS FOR INITIAL TESTING SYSTEMS FOR THE INITIATOR AND THE HAMMER, IN ADDITION TO DESIGNS FOR THE JUNCTION SWITCHES.

4. SUPPORT ACTIVITIES FOR THE PLANT SITE:

ACTIVITIES INCLUDED:

PROVIDING ENGINEERING SUPPORT FOR THE INSTALLATION AND OPERATION OF THE SERVICE SYSTEMS AND THE

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INSTALLATION OF SOME EQUIPMENT. ((LINE MISSED)) INSTALLATION AND FURNISHING A NUMBER OF TRAILERS.

TRANSFER TO NEW WORK SITE (AL-ATHIR PLANT)

IN LIGHT OF THE COMPLETION OF THE FIRST PHASE OF THE AL-ATHIR PLANT FACILITY, MOST OF THE STAFF OF THE PLANT WERE MOVED FROM THEIR DUTY POSTS IN AL-TUWAITHA TO THE NEW PLANT WORK SITE. ALSO THE EQUIPMENT, MACHINERY AND TESTING SYSTEMS WERE MOVED AND WERE INSTALLED AND PUT INTO OPERATION AT THE NEW SITE TO CONTINUE IMPLEMENTATION OF THE ACTIVITIES OF THE PLAN. THE FACILITY OF THIS PHASE WAS OPENED UP BY THE MINISTER OF INDUSTRY AND MILITARY INDUSTRIALIZATION ON 7 MAY 1990. HE LOOKED OVER THE ACCOMPLISHMENTS WHICH HAD BEEN ACHIEVED DURING THE PERIOD. THE WORK IS CONTINUING TO IMPLEMENT THE SECOND PHASE OF THE FACILITY WHICH IT IS HOPED TO BE COMPLETED BY THE END OF THIS YEAR.

((END TEXT))